

Notes on Some Little Known Arctic Alaskan Mollusks

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ABSTRACT Notes on the taxonomy, distribution and natural history of some eastern Chukchi Sea mollusks. Including: validation of the misunderstood *Neptunea middendorffiana* MacGinitie, 1859, based on its egg cases; discussion of the enigmatic *Anomalosiphon rodgersi* (Gould, 1860), an older name for the enigmatic *Volutopsius callorhinus* Dall, 1877; the peculiar egg towers of what appears to be *Buccinum obsoletum* Golikov, 1980; new distribution records for *Colus sabini* (Gray, 1824), *Buccinum beringense* Golikov, 1980 and *Neoiphinoe echinata* Egorov & Alexeyev, 1998; the first record of brooding behavior in *Trichotropis bicarinata* (Sowerby, 1825); and the identity and validity of *Plicifusus johanseni* Dall, 1919, and *Pseudopolinices nanus* (Møller, 1842) a species in need of a new name.

INTRODUCTION From 2009-2013, I participated as an invertebrate taxonomist in a series of surveys in the eastern Chukchi Sea [Northern Alaska, North of the Bering Strait and west of Point Barrow (Figure 1)]; in 2009 on the CSESPA (Chukchi Sea Environmental Studies Program); in 2010-2011 on the AKMAP (Alaska Monitoring and Assessment Program) survey; a multi-year, state wide, near-shore biodiversity survey in 2012 on the Arctic EIS (Ecosystem Integrated Survey), and in 2013 on the SHELFZ (Shelf Habitat and EcoLogY of Fish and Zooplankton) Project. This afforded me the opportunity to study the Arctic mollusk fauna. Many taxonomic, zoogeographical and natural history questions were investigated, and many rare and little known species were photographed alive for the first time. No diving was done on these surveys, but a large make shift onboard aquarium with natural substrate and invertebrate biodiversity allowed for live observations and *in situ*-like photography. The

question of the validity of the Buccinid *Neptunea middendorffiana* MacGinitie, 1859 is answered by the discovery of its uniquely sculptured egg capsules. The identity of the enigmatic *Volutopsius callorhinus* Dall, 1877 is discussed. The unusual branched tower egg masses of *Buccinum obsoletum* Golikov, 1980 are reported, the first Alaskan records for *Colus sabini* (Gray, 1824), *Buccinum beringense* Golikov, 1980, and *Neoiphinoe echinata* Egorov & Alexeyev, 1998 are presented, brooding behavior in *Trichotropis bicarinata* (Sowerby, 1825) is reported, the validity of *Plicifusus johanseni* Dall, 1919 is established, and the discovery that *Pseudopolinices nanus* is in need of a new name is reported. All collections were made by the author, and illustrated specimens are in his personal collection. Vouchers for new distribution records are deposited in the Santa Barbara Museum of Natural History.

Family: Capulidae

Neophinoe echinata (Egorov & Alexeyev, 1998) was described from the Tartar Strait, on the west side of Sakahlin Island, Russia (48°15.4 N, 154°37.4 N) (Kantor & Sysoev, 2006); the strait connects the northern Sea of Japan to the Sea of Okhotsk. The species resembles *Neophinoe kroyeri* (Philippi, 1849) in form, but is more slender and is characterized by four spiral rows of setae. The apex of Arctic specimens is frequently eroded. On 27 August, 2009, 3 specimens (Figure 2) were taken northwest of Icy Cape (71°07.19 N, 163°48.2 W) (CSESPA 2009-BF001) at 40 m, on 29 August, 2009, 4 more specimens (Figure 3) were taken at 40 m, about 30 km to the NW, at (71°08.87 N, 164°28.72 W) (CSESPA 2009-KFO25), and on 15 September, 2012 a single specimen (Figure 4) was taken North of Point Franklin (71°29.92 N, 159°03.22 W) (162-2012-2-75) at 50 m, with a bottom temperature of -1.68° C. Maximum length: 19.1 mm (apex missing).

On 8 August 2010, two specimens of *Trichotropis bicarinata* (Sowerby, 1825) (Figure 5) were taken in Ledyard Bay, NE of Cape Lisburne (69°10.37 N, 165°42.56 W) (AKCH10-017), at 22 m, together on the dead shell of a small *Neptunea ventricosa* (Gmelin, 1790); one small male (24 mm), and a much larger female (45 mm). The female was found sitting on a cluster of seven transparent capsules (Figure 6), each about 10-12 mm in diameter, with 8-12 young within; the tiny yellow juveniles, each about 1.5 mm in diameter. The entire cluster fit perfectly within the aperture of the snail. A second female individual (Figure 7, 36 mm) was taken in the same haul, sitting atop a similar but smaller, more recently deposited clutch of capsules on a small stone; the juveniles within, each about 0.8-0.9 mm in diameter. This suggests that *T. bicarinata* broods its young, perhaps until they hatch and

disseminate. Similar brooding behavior has been reported in the genus *Capulus* Montfort, 1810 (Abbott, 1968). This species was taken throughout the eastern Chukchi Sea at depths of 12-56 m with bottom temperatures of -0.4°C to 9.1°C.

Family: Naticidae

"*Pseudopolinices*" *nanus* (Møller, 1842), described as a *Natica*, Golikov & Sirenko (1988), erected the genus *Pseudopolinices* for this unusual species. A single specimen of this tiny species was taken 13 September 2011, off Solivik Island, Icy Cape (70°13.37 N, 162°35.08 W) (AKCH11-052), at 17 m. On 9 September 2012, two more specimens (Figure 8) were taken West of Icy Cape (70°29.57 N, 168°29.4 W) (162-2012-2-118), at 39 m, with a bottom temperature of 0.0°C. Originally described from West Greenland, this species has been recorded throughout the Arctic and circum-boreal region (Oldroyd, 1927; Baxter, 1987; Golikov & Sirenko, 1998; Kantor & Sysoev, 2006). The problem arises when one tries to match the Holotype, illustrated by Schiøtte & Warén (1992) with the form presently recognized as *P. nanus*. The Lectotype (Figure 9) is clearly a *Euspira*-like species with a prominent umbilicus and a thin, tenacious yellow-brown periostracum, whereas the form presently recognized as this species has a glossy white shell, apparently no periostracum, and a thick, *Cryptonatica*-like callus over the umbilicus. The operculum is corneous like in *Euspira*. It seems this unusual little naticiid is in need of a new name.

Family: Buccinidae

Neptunea middendorffiana MacGinitie, 1959 (Figures 10-12) has long been confused with its congeners *Neptunea heros* (Gray, 1850) (Figures 13 & 14) and *Neptunea ventricosa*

(Gmelin, 1790) (Figures 15 and 16). Macintosh (1976) considered it a synonym of *N. heros*, Abbott (1974) considered it to be synonymous with *N. ventricosa*, and Kantor & Sysoev (2006) also considered it a synonym of *N. ventricosa*, but considered *N. heros* to be *N. ventricosa*, and *N. ventricosa* to be *N. behringiana* (Middendorff, 1848). Baxter (1987) considered it a valid species, Tiba & Kosuge (1988) listed it as a synonym of *Neptunea bulbacea* (Valenciennes, 1858), a larger species restricted to the NW Sea of Japan and southern Okhotsk Sea, Feder, *et. al.* (1994) listed it as a valid species, Fraussen & Terryn, 2007 sorted out the *N. heros/N. ventricosa/N. behringiana* problem, but erroneously re-named what they believed was *N. middendorffiana*, from Northern Japan and the southern Kurile Islands, and *Neptunea magananimita* (Fraussen & Terryn, 2007), based on the belief that the holotype of *N. middendorffiana* was a young specimen of *Neptunea heros*, this however is a completely different species. The problem arises from the fact that, until now, very little material was available from Arctic Alaska and the morphological similarities between the three nominal species are impressive. However, MacGinitie's original description is quite adequate for recognizing the species. Trawled samples would sometimes contain hundreds of specimens of these three species, and they were easily separated by: (1) shell form, *N. heros* is variable in form, squat to elongated, shoulder may be smooth, knobbed (5-7 knobs), or have a single whitish rib with some specimens having varices. *N. ventricosa* is also variable and may be smooth, spirally ribbed or variced; it may be separated from both its congeners by short twisted canal. *N. middendorffiana* is consistently smooth except for a single (often faint) rib at the shoulder, which is generally somewhat darker than the rest of the shell with the rib having as numerous (9-15+) small knobs. (2) shell color, *N. heros* is variable in color, tan,

pink, purplish, brown or white and the apertures may be white (often flushed on the lip with pink-purple), purplish or brown, occasionally specimens with intensely orange or red-orange apertures are found. The shells of *N. ventricosa* are brown, tan or reddish-brown and the apertures are typically the same color as the exterior of the shell, though rarely some may have a white aperture. In *N. middendorffiana*, the shell is uniformly purple-brown. However due to the plasticity of the former two species, *N. middendorffiana* has been treated as a synonym of the two former species. MacGinitie, 1959 suggested the possibility that her new species might conceivably be the small male form of *N. heros* or *N. ventricosa*, and remarked that the protoconch was most similar to that of *N. ventricosa*. However numerous male and female specimens of all three species were taken in 2012 and 2013, supporting *N. middendorffiana* as a distinct species, and finding of egg capsules (Figure 17) at several stations in 2013 proved its validity beyond doubt. The egg capsules are deposited in single layer clusters, like those of *N. heros* (Figure 18), unlike the towers deposited by *N. ventricosa* (Figure 19), and the smaller *Neptunea borealis* (Philippi, 1850) [I still use *N. borealis* for Alaskan form, as I am not convinced that *Neptunea multistriata* (Aurivillius, 1885) is distinct] with which it also occurs. The egg capsules are erect and flap-like, with a slender pedicle, and measure 21 x 12 mm. The capsules are uniquely sculptured, with 4 radiating ribs, contrasting with the similarly shaped capsules of *N. heros* which are much larger, up to 35 x 20 mm, and are sculptured with countless minute dimples.

Neptunea middendorffiana has a somewhat patchy distribution, in the northeastern Chukchi Sea. It was collected at twelve stations, from the general vicinity of Point Barrow (71°15' N, 157° W) (162-2013-2-25), where it is locally abundant, south, to NW of Cape Lisburne

(170°00.22 N) (162-2012-2-120) at depths of 26-110 m on boulders and gravel, with a bottom temperature of -1.7°C to 2.0°C. It apparently does not penetrate (at least not much past Barrow) into the Beaufort Sea (based on 2008 NOAA trawl survey data/images). I have also seen a specimen from an unknown location in the Bering Sea. Maximum length: 77.7 mm.

The enigmatic *Volutopsius callorhinus* Dall, 1877 was described from a badly eroded, "beach worm" shell with a broken canal, from the Pribilof Islands. A recent examination of the type verified its deplorable, almost useless condition, "one sand-blasted shell" (Ellen Strong, *pers. com.* 2013). I originally thought that the name corresponded to a similarly shaped shell from the Aleutian Islands. However the description of "*V. callorhinus*" says that the type(s) (Figure 20) shows traces of spiral striae while the Aleutian species is smooth. Also the Aleutian species has not been found near the Pribilofs. In Arctic Alaska there is a *Colus* like species that has hitherto been called *Colus* or *Anomalosiphon verkruzei* (Kobelt, 1876) [*syn. Colus dautzenbergii* (Dall, 1916)] (Abbott, 1974), but that species is restricted to the Norwegian, Barents and Kara Seas (Kantor & Sysoev, 2006). Feder, *et. al.* (1994) listed both *Volutopsius callorhinus* and *Colus dautzenbergii* from the NE Chukchi Sea, and Baxter (1987) called it *Plicifusus callorhinus*. MacGinitie considered it a smooth form of *Plicifusus kroyeri* (Möller, 1842). Dr. James H. McLean discovered a forgotten name for the Alaskan species, *Buccinum rogersi* Gould, 1860 (Figure 21), described from 36-72 m near the Bering Strait, and now placed in the genus *Anomalosiphon* (J. H. McLean, *pers. com.* 2012). A comparison of this species with the type of *Volutopsius callorhinus* leaves little doubt that they are conspecific. The species ranges from the Pribilof Islands to the Barrow region. *Anomalosiphon rogersi* (Figure 22) was

taken at just three stations, two near Bering Strait at 50-52 m (66°01.07 N, 168°29.73 W) (162-2012-2-2) and (66°29.71 N, 168°29.70 W) (162-2012-2-124), and one from Peard Bay, near Point Franklin, SW of Barrow (71°00.25 N, 158°04.59 W) (AKCH11-047) at 27 m, and a bottom temperature of 1.5°C. Maximum length: 59.5 mm.

Colus sabini (Gray, 1824) (Figures. 23 and 24), is well known from the North Atlantic-Arctic region, ranging from the Gulf of Maine (Abbott, 1974) to the East Siberian Sea (Kantor & Sysoev, 2006) also occurs in the Beaufort Sea (James H. McLean, *pers. com.* 2010). This fragile species was taken at seven stations between Cape Lisburne (69°29.99 N, 168°33.63 W) (162-2012-2-61) and north of Barrow (71°59.25 N, 157°09.39 W) (162-2012-2-76), at depths of 51-87 m and bottom temperatures of -1.6°C to 3.7°C. This is the first record of this species in the Chukchi Sea, establishing it as circum-Arctic. The Chukchi specimens nearly always had the parasitic anemone *Allantactis parasitica* Danielssen, 1890 (Figure 24) (Ident. K. Sanamya, *pers. com.* April, 2015) attached to the shell. Maximum length: 84.6 mm.

Plicifusus johanseni Dall, 1919 (Figures 25 and 26), is a rather enigmatic species, MacGinitie (1959) did not report it. Abbott (1974) and Baxter (1987) listed it as valid, Kantor & Sysoev (2006) considered it valid, and Kosyan & Kantor (2012) also considered it valid, but based on the very poor condition of the syntypes and lack of better material, expressed uncertainty as to whether the species was recent or fossil. The main character separating this species from the similar but larger *Plicifusus kroyeri* (Möller, 1842) (Figure 27) is considered to be the lack of axial ribs on the penultimate whorl. However this character has proved to be unreliable in fresh material. *Plicifusus johanseni* may be distinguished from

P. kroeyeri by: (1) smaller, more slender shell; (2) very fine, uniform spiral lirae, compared to *P. kroeyeri* which has fine incised lines, becoming spaced further apart on the base; (3) fewer, more consistent number of axial ribs, 12-14 compared with typically 18-28 (very rarely fewer) in *P. kroeyeri* of the same size; and (4) the axial ribs of *P. johanseni* are less prominent than those of *P. kroeyeri*, typically (but not always) becoming faint or absent on the penultimate whorl. *Plicifusus johanseni* was taken at eight stations in 2012 and one in 2013, between WNW of Cape Krusenstern (67°30.54 N, 165°52.28 W) (162-2012-2-16) and North of Barrow (71°31.42 N, 157°23.25 W) (162-2012-2-48), and as far north as (72°30.63 N, 166°50.26 W) (162-2012-2-92), NW of Icy Cape, at depths of 38-91 m and bottom temperatures of -1.6°C to 4.9°C. Maximum length: 74.85 mm.

On 16 September 2011 several very strange egg masses were recovered from 110 m in Bering Canyon (71°21.99 N, 158°51.62 W) (AKCH11-064). The egg capsules were of the *Buccinum* type, thin, whitish, flap-like, but were deposited in slender, coiled towers, which branched repeatedly, in a tree-like fashion (Figure 28), something unheard of in *Buccinum*, which generally deposit eggs in irregular masses or mounds, though some species (*i.e.* *Buccinum scalariforme* Möller, 1842 (Figures 29 and 31) and *Buccinum plectrum* Stimpson, 1865) (Figures 30 and 32) lay irregular, tower-like mounds. The egg capsules themselves very from flap-like to lenticular, and may be soft as described above, or more inflated and rigid as in *Buccinum glaciale* Linnaeus, 1761 (Figures 30 & 33). The only unusual species of *Buccinum* taken in the sample was *Buccinum obsoletum* Golikov, 1980 (Figure 35). Fortunately, many of the capsules were near to hatching and the juvenile snails were collected. The juveniles (Figure 34) appear to be those of *B. obsoletum*.

Buccinum obsoletum was described from the northern Okhotsk Sea, but is reported to range into the northern Bering, Chukchi and East Siberian Seas at depths of 18-146 m (Kantor & Sysoev, 2006). However, it has never been reported from Alaskan waters. In 2012 and 2013, *B. obsoletum* and its apparent egg "trees" was collected at eight stations, from northwest of Cape Lisburne, (69°30.10 N, 167°07.30 W) (162-2012-2-57), to North of Barrow (71°41.32 N, 156°41.62 W) (162-2013-2-16), at depths of 43-110 m, with bottom temperatures of -1.7°C to 5.4°C. Maximum length: 55.6 mm.

Buccinum beringense Golikov, 1980 (Figure 36), was described from the western Bering Sea, but has not been reported from Alaskan waters. In August, in 2011, a single specimen was taken northwest of Wainwright (70°55.1 N, 160°54.31 W) (AKCH11-059), at 51 m. Specimens were taken at four stations in 2012 & one station in 2013, between Kotzebue Sound (66°30.05 N, 162°12.48 W) (162-2012-2-10) and North of Barrow (71°41.32 N, 156°41.62 W) (162-2013-2-16), at depths of 12-82 m, with bottom temperatures of -1.5°C to 2.1°C. This looks to be what MacGinitie (1959) called *Buccinum moerchianum* (Dunker, 1858) (Figure 37), which is a Gulf of Alaska species, not found in the Arctic. Maximum length: 77.8 mm.

ACKNOWLEDGMENTS

I wish to thank Dr. Stephen C. Jewett, Mr. Douglas Dasher and Dr. Army Blanchard of University of Alaska Fairbanks, Institute of Marine Science; Dr. James H. McLean (Emeritus), and Mr. Lindsey Groves of the Los Angeles County Museum of Natural History; Dr. Ellen Strong of the Smithsonian Institution; Dr. Henry Chaney of the Santa Barbara Museum of Natural History; Mr. Bob Lauth, Dr. James Orr, Dr. Lyle Britt, and Dr. Elizabeth Loggerwell of NOAA/NMFS, Alaska Fisheries Science Center;

Dr. Leandra de Sousa of the North Slope Borough, Dept. Wildlife Management; Dr. Karen Sanamya of the Pacific Institute of Geology, Kamchatka Branch; Dr. James McCarthy and Adam Baldinger, of the Museum of Comparative Zoology, Harvard University; and the Captains and Crews of the M/V Western Wind, R/V Norseman II, and F/V Alaska Knight. The comments of two anonymous reviewers are also gratefully acknowledged.

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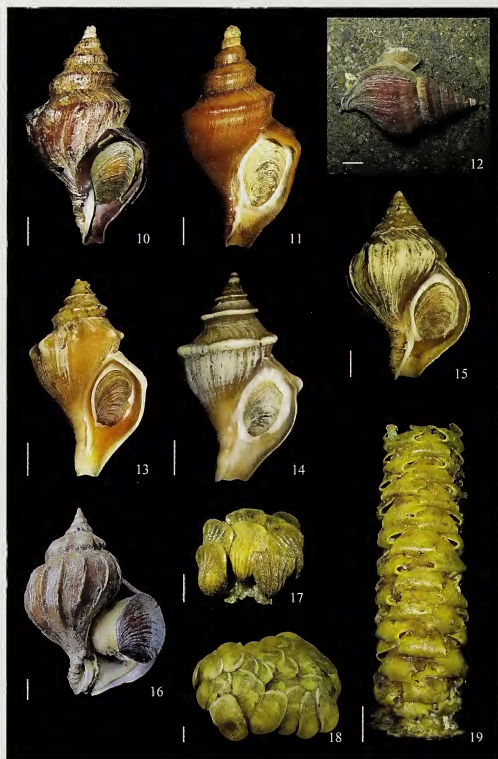
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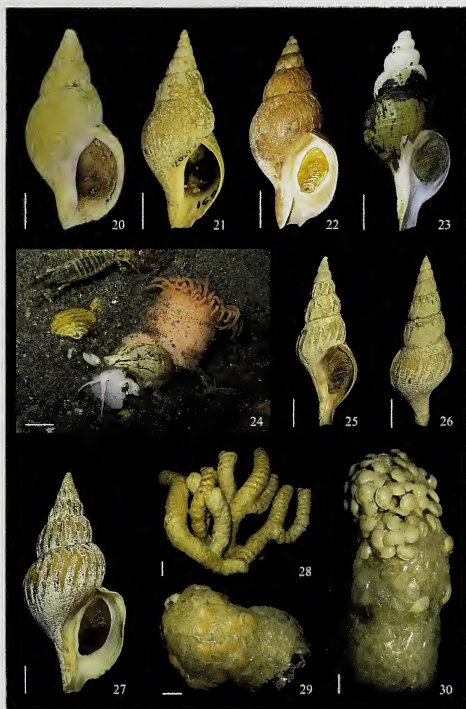
Figure 1. Map, Eastern Chukchi Sea, Arctic Ocean, Alaska.



Figures 2-4. *Neophinoe echinata* (Egorov & Alexeyev, 1998). Figure 2. NW of Icy Cape (71°07.19 N, 163°48.2 W), 40 m (*leg.* Aug. 2009); Figure 3. NW of Icy Cape (71°08.87 N, 164°28.72 W), 40 m (*leg.* 29 Aug. 2009) Figure 4. Live animal, N of Point Franklin (71°29.92 N, 159°03.22 W), 50 m (*leg.* 23 Aug. 2012) (bars = 1 cm). **Figures 5-7.** *Trichotropis bicarinata* (Sowerby, 1825), Ledyard Bay, NE of Cape Lisburne (69°10.37 N, 165°42.56 W), 22 m (*leg.* 8 Aug. 2010) (bars = 1 cm). **Figures 8-9.** "*Pseudopolinices*" *nanus* (Møller, 1842). Figure 8. West of Icy Cape (70°29.57 N, 168°29.4 W), 39 m (*leg.* 9 Sept. 2012); Figure 9. Lectotype (after Schiøtte & Warén, 1992), West Greenland (bars = 5 mm).



Figures 10-12. *Neptunea middendorffiana* MacGinitie, 1959. Figure 10. N of Barrow, Alaska (71°15.41 N, 158°38.71 W), 110 m (leg. 21 Aug. 2013); Figure 11. NW of Icy Cape, Alaska (70°59.64 N, 165°25.67 W), 41 m (leg. 13 Sept. 2012); Figure 12. NW of Wainwright, Alaska (70°59.6 N, 160°52.38 W), 45 m (leg. 23 Aug. 2012) (bars = 1 cm). **Figures 13-14.** *Neptunea heros* (Gray, 1850). N of Cape Lisburne, Alaska (69°59.75 N 165°35.15 W), 40 m (leg. 26 Aug. 2012) (bars = 1 cm). **Figures 15-16.** *Neptunea ventricosa* (Gmelin, 1790). Barrow, Alaska (71°07.86 N, 158°30.43 W), 50 m (leg. 22 Aug. 2013) (bars = 1 cm). **Figures 17.** *Neptunea middendorffiana* MacGinitie, 1959, egg capsules. Peard Bay, NE of Point Franklin, Alaska (71°04.15 N, 158°26.28 W), 26 m (leg. 22 Aug. 2013) (bar = 1 cm). **Figure 18.** *Neptunea heros* (Gray, 1850), egg capsules. NE of little Diomed Island, Alaska (66°30.63 N, 168°30.04 W), 49 m (leg. 12 Aug. 2012) (bar = 1 cm). **Figure 19.** *Neptunea ventricosa* (Gmelin, 1790), egg capsules. NE of little Diomed Island, Alaska (66°30.63 N, 168°30.04 W), 49 m (leg. 12 Aug. 2012) (bar = 1 cm).



Figures 20-22. *Anomalosipho rogersi* (Gould, 1860). Figure 20. Holotype, *Volutopsius callorhinus* Dall, 1877, USNM 271711, Saint Paul Island, Pribilof Islands, Alaska (57°10' N, 170°20' W), beach drift; Figure 21. Lectotype *Buccinum rogersi* Gould, 1860, MCZ 169338, Bering Strait (66° N, 169° W); Figure 22. Bering Strait, NE of Little Diomedé Island (60°01.07' N, 168°29.73' W), 50 m (leg. 12 Aug. 2012) (bars = 1 cm). **Figures 23-24.** *Cohus sabini* (Gray, 1824). N of Barrow, Alaska (71°43.25' N, 159°49.06' W), 71 m (leg. 24 Aug. 2013) (bars = 1 cm). Figure 24. Living animal with parasitic anemone *Allantactis parasitica* Danielssen, 1890 on shell. **Figures 25-26.** *Plicifusus johanseni* Dall, 1919. Figure 25. WNW of Cape Krusenstern, Alaska (67°30.39' N, 165°52.23' W), 38 m (leg. 17 Aug. 2012), ventral. Figure 26. N of Cape Lisburne (72°30.61' N, 166°50.26' W), 48 m (leg. 10 Sept. 2012), dorsal (bars = 1 cm). **Figure 27.** *Plicifusus kroeyeri* (Möller, 1842). N of Cape Lisburne, Alaska (70°01.42' N, 167°00.35' W), 47 (leg. 2 Sept. 2012) (bar = 1 cm). **Figure 28.** *Buccinum obsoletum* Golikov, 1980, egg capule "tree". Barrow Canyon, N of Barrow, Alaska (71°21.99' N, 158°51.62'), 110 m (leg. 16 Sept. 2011) (bar = 1 cm). **Figures 29-30.** *Buccinum* spp. egg masses, typical of *Buccinum scalariforme* Møller, 1842 & *Buccinum plectrum* Stimpson, 1865, N of Cape Lisburne (71°29.83' N, 166°56.2' W), 46 m (leg. 13 Sept. 2012), and *Buccinum glaciale* Linnaeus, 1761, Figure 30. Over-laid on a mound of *B. scalariforme* eggs, N of Point Franklin, Alaska (71°00.57' N, 159°00.24' W), 45 m (leg. 24 Aug. 2012) (bars = 1 cm).

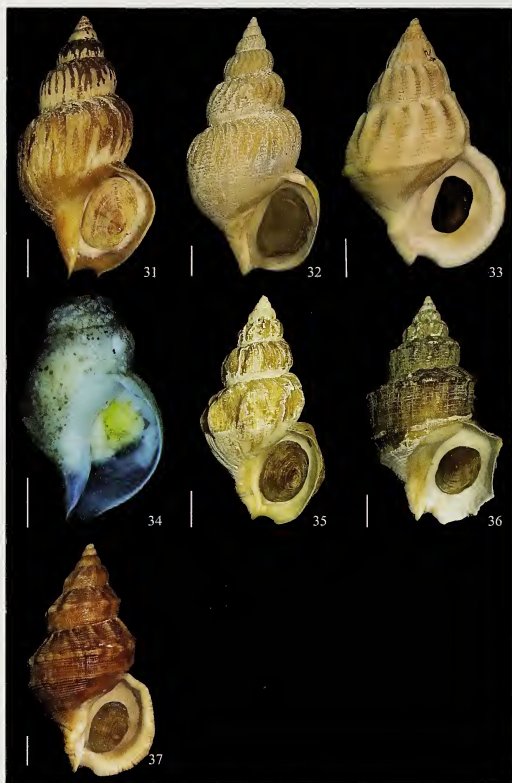


Figure 31. *Buccinum scalariforme* Möller, 1842. N of Cape Lisburne (71°29.83 N, 166°56.2 W), 48 m (leg. 13 Sept. 2012) (bar = 1 cm). **Figure 32.** *Buccinum plectrum* Stimpson, 1865). N of Cape Lisburne (71°29.83 N, 166°56.2 W), 48 m (leg. 13 Sept. 2012) (bar = 1 cm). **Figure 33.** *Buccinum glaciale* Linnaeus, 1761. N of Point Franklin, Alaska (71°00.57 N, 159°00.24 W), 45 m (leg. 24 Aug. 2012) (bar = 1 cm). **Figures 34-35.** *Buccinum obsoletum* Golikov, 1980. **Figure 34.** Sub-hatchling. Barrow Canyon, N of Barrow, Alaska (71°21.99 N, 158°51.62), 110 m (leg. 16 Sept. 2011) (bar = 1 mm). **Figure 35.** NW of Point Lay, Alaska (71°00.39 N, 163°51.54 W), 43 m (leg. 4 Sept. 2012) (bar = 1 cm). **Figure 36.** *Buccinum beringense* Golikov, 1980. NW of Cape Lisburne, Alaska (70°29.57 N, 168°29.42 W) 36 m (leg. 15 Sept. 2012) (bar = 1 cm). **Figure 37.** *Buccinum moerchianum* (Dunker, 1858). Petersburg, Wrangell Narrows, Mitkof Island, Alaska (56°48 N, 132°58 W), 1 m (leg. 27 Aug. 1992).